Questions/Requests for the Applicant:	Response
Please label the injection wells or the injection well site on Figure 2.	Complete
Was any data collected or testing performed during drilling of the 355-7R injection well? If so, please characterize this data.	During the drilling of 355-7R in 1973, the following characterizing logging measurements were obtained – Gamma Ray (GR), Spontaneous potential (SP), Resistivity (Dual induction laterlog), Density, Neutron Porosity and formation dip from 10,509' to 3,393', covering the Etchegoin, Reef Ridge and Monterey formations. In addition, 28 sidewall core samples were also obtained over the same interval, however no detailed analysis of the core samples was performed at the time.
The AoR and Corrective Action Plan (on pg. 3) states that, the "Monterey Formation sands are bound above by the regional Reef Ridge Shale, and below by the Lower Antelope Shale Member of the Monterey Formation." Please clarify the difference between the A2 Shale and the Lower Antelope Shale.	The A2 Shale lies directly beneath the Monterey Formation A1-A2 reservoir and provides hydraulic separation with the Monterey Formation A3-A11 reservoir. The Lower Antelope Shale is at the base of the Monterey Formation.
Does the Antelope Shale provide confinement? If so, please provide additional discussion of the confining properties.	The Lower Antelope Shale does not provide confinement for the Monterey Formation A1-A2 reservoir.
What is the source of the statement about the pressure differential between the Monterey A1- A2 Sands and the Monterey A3-A11 Sands described on pg. 10?	Figure 10.
Please provide pressure build-up test results for the 357-7R injection well.	Request technical discussion prior to inclusion in the preoperational testing plan.
Several of the figures in the narrative that contain data are difficult to read (e.g., Figures 14 and 15); please provide higher resolution versions of this information.	Complete
Please provide a map of the Elk Hills Oil Field that shows the 355-7R and 357-7R injection wells, along with the wells planned for the Elk Hills 26R Storage Project (with a scale that shows distances).	Complete - Figure 8
Faults and Fractures	
Please update Figure 10 to clearly label the formations in which the thrust faults terminate.	Complete
Where were the 66 oil samples collected within the EHOF described on pp 13-14, relative to faults within the field?	See Figure 2
Depth, Areal Extent, and Thickness of the Injection and Confining Zones	
The depths listed in Table 1 for the Monterey A1-A2 Sands are inconsistent with the logs in Figure 9. It appears, based on the log, that the depth to the Monterey A1-A2 Sands is ~8,500 feet MD or ~7,700 feet TVD at the 357-7R injection well, not 8,403 feet TVD as stated in Table 1. The mean depth to the Monterey Formation is also listed as 5,907 ft when the low and high depths are listed as 8,403 ft and 9,589 ft respectively. Please clarify the discrepancy or revise Table 1.	Table 1 depths represents the distribution over the AoR and are in true vertical depth. The logs in figure 9 are annotated with measured depth and sub-sea true vertical depth. The 5,907 foot value in table has been updated.
There is a typo on Figure 16, "Capitally" for Mercury Injection Capillary Pressure. Please fix this when the application is updated.	Complete
Please characterize, name, and provide depth and permeability data for the underlying confining unit, if one exists.	See page 10
Hydrologic and Hydrogeologic Information	
It appears that Figure 26 provides information on the depth and regional extent of the area shown in cross section with wireline logs for TDS content, however the resolution is low (pg. 31). Please provide a higher resolution version of Figure 26.	Complete
What is the depth of the Upper Tulare Formation and the separation of this lowermost USDW from the injection zone and the confining zone within the AoR?	Page 34

Is the Upper Tulare USDW present within the modeled AoR of the injection wells?	Yes, refer to page 34 and 35.
Geochemistry/Geochemical Data	
Please provide clear/legible versions of the sample analyses in Figures 30 and 31 to allow a review of the sampling performed.	Complete
Where is Well 381-17R?	Page 40
What is the total dissolved solids (TDS) content of the Monterey Formation? Please indicate how many data points or measurements are available to support this measurement (i.e., based on past field operations) and, if they are not from throughout the AoR, please provide information to support a determination that the Monterey Formation is not a USDW.	Page 40
Is any water quality data available for the Etchegoin Formation? If so, please provide this	Included in preoperational testing plan.
In the Testing and Monitoring Plan, CTV states that they obtained a baseline analysis for the 61WS-8R well (apparently for the Tulare Formation). Please provide this analysis if it is not the same as is provided in Figure 30.	CTV will drill a new monitoring well. Baseline results will be included in preoperational testing plan.
Geomechanical and Petrophysical Characterization	
Please update Figure 23 to include base case pressure.	Base case pressure is in the red line that is covered by the reduced Young's Modulus case.
Please discuss the selection of the base case parameter values (i.e., Young's Modulus, thickness, etc.) in the geomechanical modeling.	See page 28 and 29.
Please explain what is meant by "anneal discontinuities" in the discussion on page 23.	Uncompacted, low-density shales are extremely ductile and can thus accommodate large amounts of strain without undergoing brittle failure and loss of top seal integrity.
The application references core data from 13 wells on page 17. o To which wells does this refer and where are they located? o If they are not distributed throughout the AoR, please describe how they are representative of the entire area that will be affected by injection.	Updated Figure22.
Where are the 18 wells that are the source of ductility data referred to on pg. 23 located?	See Figure 19.
The application states that, "The final/maximum values for surface and downhole injection pressures are far below (~2,000 psi) those associated with the Class II permitted fracture gradients of .8 psi/foot," and that, "the final reservoir pressure target of 4,000 PSI is significantly below the Reef Ridge confining shale estimated minimum geomechanical failure pressure of ~7,500 PSI" (pg. 46). Please clarify the sources of data used to determine failure pressure, fracture pressure, and fracture gradient.	The tensile failure for Reef Ridge is 7,500PSI based on geomechanical modeling. The Reef Ridge Shale confining layer fracture pressure will be addressed in preoperational testing. The Monterey Formation fracture gradient is 0.82 based on a test in 327-7R-RD1. See table 3 and page 26.
Mineralogy of the Injection and Confining Zones	
Please provide a map of the 9 well locations used for XRD described on pages 16-17.	See Figure 17.
What evidence is there for depositional continuity and facies consistency within the EHOF, as described on page 17?	See Figure 16 and page 17 text.
Seismic History and Seismic Risk	
Please include all earthquakes of magnitude 3.0 and above in Figure 24.	Updated
To inform an evaluation and documentation that there is no significant seismic risk, EPA recommends that CTV describe how the project:	See page 31 and 32
has a geologic system free of known faults and fractures and capable of receiving and containing the volumes of CO_2 proposed to be injected.	

will be operated and monitored in a manner that will limit risk of endangerment to USDWs, including risks associated with induced seismic events;	
will be operated and monitored in a way that in the unlikely event of an induced event, risks will be quickly addressed and mitigated; and	
poses a low risk of inducing a felt seismic event.	
Facies Changes in the Injection or Confining Zones	
Please clarify what data sources were used to determine inputs for the geomodel where applicable, e.g., the inputs for sand vs. shale facies as discussed on pg. 40.	See Figure 16 and page 17 text.
Please also discuss how a sufficient number and distribution of formation characterization data are available to demonstrate a lack of local heterogeneities that could affect storage or confinement of CO2.	See Figure 16 and page 17 text.
Please specify the names, number, and locations of wells used to characterize formation thicknesses for the maps in Figure 13.	See Figure 16
CO2 Stream Compatibility with Subsurface Fluids and Minerals	
Please provide evidence for the statement in the Application on page 39 that the quartz and feldspar in the Monterey A1-A2 Sands are stable in the presence of CO2 and carbonic acid?	Included in preoperational testing plan.
Please elaborate on why use of the Peng-Robinson Equation of State supports compatibility of the CO2 with any fluid which may be contained within the Reef Ridge Shale.	Due to the extremely low permeability of the Reef Ridge Shale (< 0.01mD) and the high capillary entry pressure (4,220psi), the Peng Robinson Equation of State based simulation is valid to model the project over the expected reservoir pressure range of 250 – 4,000psi as there should be no entry of the CO2 injectate into the Reef Ridge.
Confining Zone Integrity	
Were any other tests performed to corroborate pressure measurements in the Reef Ridge Shale?	Included in preoperational testing plan.
The application, on pg. 14, states that there is a pressure differential of 1,300 psi between the overlying Etchegoin Formation and Monterey Formation due to the sealing nature of the Reef Ridge Shale. What is the source of the pressure data for this statement?	See Figure 13.